Glucose biosensor based on nickel ferrite composite materials modified glassy carbon electrode

Chantarattana Nontapha¹, Anchana preechaworapun², Tanin Tangkuaram³*

¹Chemistry Program, Faculty of Science, Maejo University, Chiang Mai 50290, Thailand
²Chemistry Program, Faculty of Science and Technology, Pibulsongkram Rajabhat University, Phitsanulok 65000, Thailand
³Applied Chemistry Program, Faculty of Science, Maejo University, Chiang Mai 50290, Thailand
*E-mail: tanin.tang@gmail.com

Abstract: The development of novel glucose biosensor using poly (diallyldimethylamonium chloride) capped gold nanoparticles (PDDA-AuNPs) with nickel ferrite nanoparticles (NiFe₂O₄NPs) and Poly(o-phenylenediamine) (POPD) in the scaffold of chitosan linked carbon nanotube (CNT-CHIT) and glucose oxidase (GOx) was developed. PDDA-AuNPs were synthesized by citrate reducing method, and then NiFe₂O₄NPs were attached on the CNT-CHIT modified glassy carbon electrode and covered with GOx. The morphological characterization of each nanoparticles and electrode surface was examined by energy dispersive X-ray spectroscopy (EDX) and scanning electron microscopy (SEM). The electroanalytical potential was applied at -0.35 V for glucose determination in 0.05 M phosphate buffer solution pH 7.4. The figure of merits of this biosensor was linearity in the range of 5 µM to 6 mM (R²=0.999) with a detection limit of 1.21 µM glucose. This biosensor exhibits excellent repeatability (% RSD=3.38 %, n=5), and reproducibility (%RSD=3.76%, n=5) without interfered from common electroactive species such as ascorbic acid, uric acid and dopamine. The glucose biosensor will be applied to analyze glucose in blood sample in near future.

Keywords: Poly (diallyldimethylamonium chloride) capped gold nanoparticles; Glucose biosensor; Nanoparticles; Chitosan scaffold